

rejected as not having received a sufficient education. The report of the examiners shows an improvement in the mean capacity of candidates. Many young men are admitted, without having to pass previous examinations, Bachelors of Arts, Sciences, or Letters, Pupils of Public Schools of Arts and Public Works and Mines, and Beaux Arts, and a few other institutions. The number of the volunteers of that class is about 4,000. Each volunteer has to pay besides a sum of 60*l.* to the Government. Education must be combined with money, in order to shorten the service in the remodelled French army.

THE study of "seaweeds" is probably affected as much by the general public as that of fish; and whether or not the great mass of people who visit the Brighton Aquarium and other similar resorts really go there with any idea of becoming more intimately acquainted with the wonders of the deep, there is no doubt that the exhibition of varieties of ocean plants would be as popular as that of fish. A seaweed growing in water is very different from seaweed cast up on the shore, and a careful selection and arrangement of specimens would greatly enhance the interest of the tanks, while at the same time their presence would prove beneficial to the fish. We recommend the hint to the notice of the authorities of the Brighton, Crystal Palace, and Southport Aquariums.

AN Industrial Exhibition is to be held at Leighton Buzzard for a short time about Whitsuntide 1875. The district to be represented is limited to a radius of twenty miles around Leighton Buzzard, and the proceeds of the exhibition will be devoted to the formation of a lecture fund for the purpose of securing courses of high class (largely scientific, we hope) public lectures in connection with the Working Men's Society, and the increase of the Society's library.

To increase the general instructiveness of their Museum, the Leeds Philosophical and Literary Society have published Descriptive Guides to the different collections of which it is composed. That on the British Birds, by Mr. L. C. Miall, is before us, containing a short and instructive account of each species exhibited. This method of combining instruction with amusement is one which it would be well if other public institutions were to adopt, instead of leaving their collections, often valuable ones, for the idle gaze of the many uninitiated, and the careful study of the but too few special students of special branches of science and art.

IN many parts of the coasts of this country where fish are abundant, enormous quantities are used as manure: in Cornwall and on the Eastern coasts this is particularly the case, but no means are adopted to convert the fish into a manufactured manure, and they are thrown, as caught, on the land. The same remarks apply to America. But recently a system has been adopted in certain localities by which the fish are prepared specially for manuring the land. At Lucages, Long Island, a factory has recently been established, for preparing the surplus quantities of "Menhaden" caught near there. The oil is first extracted from the fish, and the residue is prepared in a certain manner and converted into "fish guano," which has a good reputation as a fertiliser.

ARRANGEMENTS have been made for placing on board one of the steamers running between Liverpool and New York, one of the "American Aquarium Cars," a newly invented contrivance for transporting live fish, which has succeeded very well in long overland journeys, and by means of which it is hoped to effect a useful interchange of living fish of various kinds between this country and America. There are many American fish which might with benefit be introduced into England, and we at the same time might transport to the other side of the Atlantic some varieties of fish which are not found there.

THE exhibition of insects in the Orangery of the Tuileries Gardens, Paris, has been brought to a close. The distribution of prizes took place on October 5. The higher medals were taken by a Viennese *savant* for a magnificent atlas exhibiting all the organs and forms of *Phylloxera vastatrix*; but the Phylloxera question is left open, and no reasonable solution appears to have been presented. Lectures were delivered daily on entomology, and every one of them was illustrated by projections with the solar microscope. Almost every kind of insect was thus presented to the public. The exhibition proved wonderfully successful; more than 20,000 persons paid the entrance fee, and the number of free tickets issued amounted to 30,000 in the brief space of twelve days.

WE have received a lecture on "The Life and Works of Dr. Priestley," delivered in Paris at the time of the celebration of the Priestley-Centenary by M. W. de Fonvielle. It is published by Auguste Ghio, and is dated 1875.

THE additions to the Zoological Society's Gardens during the past week include a Bengalese Leopard Cat (*Felis bengalensis*) and a Common Paradoxure (*Paradoxurus typus*) from India, presented by Capt. W. Reynolds; a Great Eagle Owl (*Bubo maximus*), European, presented by Lord Londesborough; an Indian Fruit Bat (*Pteropus medius*) from India, presented by Dr. Stafford; a Monteiro's Galago (*Galago monteiroi*) from Angola; a Tooth-billed Pigeon (*Didunculus strigirostris*) from the Samoan Islands, deposited; two Geoffroy's Doves (*Peristera geoffroyi*) from the Island of Fernando de Noronha, and a Gentoo Penguin (*Pygosceles taeniatus*) from the Falkland Islands, new to the collection, purchased.

KENT'S CAVERN*

BEFORE entering on this, their tenth Report, the committee desire to express their deep sense of the great loss they have sustained in the decease of Prof. Phillips. No member was more regular in his attendance at the meetings of the Committee or felt a livelier interest in the investigation with which they are charged. On March 18, 1874—little more than a month before his lamented death—though suffering from a severe cold, he visited the cavern, when he carefully inspected those branches of it which had been explored, and expressed his admiration of the clearness and importance of the evidence bearing on the question of human antiquity which had been obtained.

The investigation has been pursued without intermission during the entire period which has elapsed since the meeting at Bradford in 1873; the mode of operation has been that described in previous Reports and followed from the commencement; the work has been performed in the most satisfactory manner by the same workmen; and the superintendents have continued their daily visits and carefully recorded the results from day to day.

The interest felt in the exploration by the inhabitants and visitors of Torquay has suffered no abatement, and the superintendents have conducted a large number of persons through the cavern, including the members of the South-western Branch of the British Medical Association during a meeting of that body held at Torquay, and also the members of the Birmingham Natural History and Microscopical Society whilst on a scientific excursion to South Devon.

During May 1874, an arrangement was made with the superintendents by Prof. A. Newton of Cambridge, for Mr. Slater, one of the naturalists of the Rodrigues Transit Expedition, to spend some time in the cavern, studying the mode of exploration followed there; it being probable that he might have to explore some very interesting caves which exist in the island. Mr. Slater reached Torquay on the 1st of June, when everything was done to facilitate his purpose, and he spent some days watching the men at work.

Live rats continue to present themselves in the cavern from time to time, and prove occasionally to be very troublesome. Thus, in October 1873, one carried off six candles during the afternoon from a spot selected because it was believed to be in-

* Tenth Report of the Committee for Exploring Kent's Cavern, Devonshire. (Abstract.)

accessible even to rats, and which had been used as the candle store during a period of three years without any previous loss of the kind; and in the same month another ate through one of the workmen's basket between the hours of nine and one, and carried off his dinner. A large number have been captured during the last twelve months.

During summer, bees have frequently been seen and heard in the innermost branches of the cavern, very far beyond any glimmering of day-light.

The branches of the cavern in which the researches have been carried on since the ninth Report was presented in 1873, are those known as the Long Arcade, Underhay's Gallery, the Cave of Inscriptions, and Clinnick's Gallery. The exploration of the former two has been completed, but the work is still in progress in the latter. The deposits have been, in descending order, like those reported last year: first, or uppermost, the Granular Stalagmitic Floor, from 12 to 30 inches in thickness; second, the Cave Earth, which has nowhere been more than two feet deep, but has rarely exceeded one foot, and has occasionally thinned out altogether; third, the Crystalline Stalagmitic Floor, usually exceeding the Granular Floor in thickness, but which had, in certain places, been partially broken up and removed by some natural agency before the deposition of the cave earth; and, fourth, or lowest known, the Breccia, consisting of materials not derivable from the cavern hill, and which appear to have been introduced through openings or mouths of the cavern at present choked up and unknown. The depth of this deposit has not been ascertained, as its bottom has nowhere been reached.

In the Long Arcade the surface of the upper or granular stalagmite was occupied with large natural "basins," some of them 12 inches deep, such as have been described in previous Reports. The following points of interest were noted respecting them during the progress of the work:—

1. The stalagmite forming their walls was harder and tougher than that surrounding them; whilst that composing their bottom was comparatively soft and friable.

2. The walls were traceable through the entire thickness of the Stalagmitic Floor; in other words, during the entire deposition of the floor, basins had existed in it, the bottom rising with the walls, but at a slower rate.

3. The water which filled them in rainy seasons passed down through the bottom in three or four hours at most.

4. Immediately beneath most of the basins there was an almost continuous interspace of about half an inch in height between the bottom of the stalagmite and the top of the cave earth; caused, no doubt, by the finer particles of the deposit being carried by the percolating water through interstices to a lower level.

It happened that the exploration of that part of the Arcade in which the basins were thus numerous was carried on during a wet season, when the water, passing through the Stalagmitic Floor, as just mentioned, caused two or three slips of the deposits beneath. In the largest of these a well-rolled flint nodule was found with some remains of animals. No such specimen had been previously seen within the cavern.

At the junction of the Long Arcade, the Cave of Inscriptions, and Clinnick's Gallery, there is a huge boss of stalagmite, in the form of the frustrum of an oblique cone, 43 feet in basal circumference, 14 feet along the slant side—which forms an angle of 40 degrees with the horizon, and thus gives a vertical height of fully 13 feet for the mass—and contains probably no less than 630 cubic feet of stalagmite. Its base consists of the older or crystalline stalagmite, and the upper portion, without any intervening cave earth, of the granular variety, which not only surrounded and completely encased the former, but, by flowing in copious sheets, formed the thick Granular Floor, spreading without a break and for great distances in every direction. Though inscriptions exist in various parts of the cavern, this mass is, with perhaps the exception of the almost inaccessible Crypt of Dates, more thickly scored with names, initials, and dates than any other equal area within the cavern; and hence it has acquired the name of the Inscribed Boss of Stalagmite. The inscriptions occupy its outer or most exposed semi-surface, where in certain places they form a network. Letters of all sizes, from some fully three inches in height to others as small as ordinary writing, cross each other and thus add to the difficulty of decipherment. Some of them were cut with great care and finish, and must have occupied a large amount of time, whilst others were but hasty scratches. It seems to have been somewhat fashionable to surround the inscriptions with rectangular parallelograms, varying from 6'5 to 3'75 inches in length, by 5'5 to 3'5 in breadth. In

at least one or two cases the cutting of the parallelogram preceded that of the inscription, as the latter extends beyond the boundary. Not unfrequently several names occur together, whether within a parallelogram or not, and in each such case the entire work seems to have been performed by the same hand. At least four of them belong to the seventeenth century, and the earliest of the series, so far as at present known, is that of "Peter Lemaire, Rich. Colby, of London, 1615." Amongst the names is that of "Deluc," probably the well-known geologist, "Champernowne," that of a well-known old Devonshire family, and several prevalent in the immediate district.

In 1846 the Torquay Natural History Society appointed a committee of three of its members, including the two superintendents of the present exploration, to make some very limited researches in the cavern. One of the spots which that committee selected was in Clinnick's Gallery, immediately adjacent to the inscribed boss, where they made a very small excavation. The materials dug up on that occasion were, as usual at that time, thrown on one side, where they remained until removed in May last when they were taken out of the cavern by the present committee. Before this was done, the surface of the mass was carefully examined to ascertain what thickness had been reached by the stalagmite which, as the superintendents well knew, had been accreting on it during the last twenty-eight years. The result was a small film not thicker than ordinary writing-paper, and limited to two examples, each covering not more than two or three square inches.

Underhay's Gallery was found, when the work of exploration was completed, to be about 20 feet long, from 2'5 to 7 feet wide, and from 6 to 7'5 feet in height, the latter measurement being taken from the bottom of the excavation. Before the committee commenced their operations there, its mouth was almost entirely closed with large masses of limestone. Notwithstanding this, the late Mr. Underhay, for several years guide to the cavern, forced himself into the gallery about fourteen years ago, even though after passing the entrance, he must have found the Granular Stalagmitic Floor within a foot of the roof in certain places. Here he found *on* and *sticking into* the stalagmite a few small bones which he succeeded in bringing out, when they were found to be phalanges of human feet. Though these specimens did not appear to be of an antiquity at all approaching that of the cave-hyæna and his contemporaries, the superintendents, who were familiar with them, very carefully watched the progress of the work, in the hope of finding some further traces of the skeleton; and on reaching Mr. Underhay's very limited diggings they met with a series of bones, all *on* and *in* the stalagmite, some of which were certainly human, whilst others were as clearly not so. The whole were at once sent to Mr. George Busk, a member of the committee, who has been so good as to forward a report on them to the effect that twenty-eight of the specimens are human, and include an astragalus, a navicular bone, a trapezium, a patella, a metatarsal, an ectocuneiforme, phalanges of fingers and toes, and fragments of humeri, ribs, and vertebrae; that they appear to be the remains of an adult individual of small size and delicate make, and probably of a female, on which point, however, it is impossible to speak positively; that the bones are not necessarily of any very remote antiquity; that the remaining specimens are not human, but belong to small sheep or goat, probably the former, which must have been of the smallest Welsh type.

When the very contracted character of this gallery, prior to its excavation by the committee, is borne in mind, it is difficult to understand how the remains were introduced. There were neither potsherds nor charcoal, nor, in short, anything suggesting that the bones were the remnants of a body disposed of by cremation, such as were met with in another branch of the cavern in 1872; nor were there any marks of teeth on the bones such as might have been expected had they been taken thither by a carnivorous animal, or the relics of a skeleton buried or secreted there, of which all other portions had been carried off by some carnivore.

The only noteworthy objects met with in the Granular Stalagmitic Floor during the year were a tooth of bear, fragments of bone, one considerable "find" of coprolites, and charred wood on two occasions, all of which occurred in the Long Arcade.

The Cave Earth has yielded during the period under notice 187 teeth of various kinds of mammals, of which 94 occurred in Underhay's Gallery, 63 in the Long Arcade, 20 in the Cave of Inscriptions, and 10 in Clinnick's Gallery; 102 belonged to hyæna, 36 to bear, 27 to horse, 8 to elephant, 8 to fox, 4 to rhinoceros, 1 to lion, and 1 probably to wolf. There were also

numerous bones and fragments of bone, of which some were gnawed, and a few appear to have been burnt. Coprolites were very abundant, 69 distinct "finds" having been met with during the twelvemonth. They sometimes, though rarely, consisted of a solitary ball, whilst at others upwards of 20 were lying together and not unfrequently cemented into large lumps. Occasionally the amount of matter of this kind found in a single day was sufficient to fill a large basket.

Fifteen specimens of flint and chert were also met with in the cave earth, 6 of them occurring in the Cave of Inscriptions, 5 in Underhay's Gallery, 2 in the Long Arcade, and 2 in Clinnick's Gallery. The finest of the series is No. 6324, found December 30, 1873, in the second foot-level, beneath the floor of granular stalagmite from 2 to 2½ feet thick. It is a very symmetrical tongue-shaped tool, fashioned with much labour out of a chert nodule, and worked to an edge all round the perimeter except at the butt end, where portions of the original surface remain on both faces. It is 3·8 inches long, 2·3 inches in greatest breadth, 1·5 in greatest thickness, and convex on both faces, from each of which several flakes have been struck. Though fashioned out of a nodule, which is very rarely the case amongst the cave-earth implements, its symmetrical form and comparatively high finish are highly characteristic of the era to which it belongs.

No object of interest of any kind has been found in the Crystalline Stalagmitic Floor during the year; but the Breccia lying beneath it has been by no means unproductive. In this oldest of the cavern deposits the remains have been, as heretofore, exclusively those of bear, so far at least as is at present known, and in addition to a large number of bones, including a considerable portion of a skull, 441 teeth have been met with in it, of which 149 were in the Long Arcade, 115 in Underhay's Gallery, 91 in the Cave of Inscriptions, and 86 in Clinnick's Gallery.

Twenty-six specimens of flint and chert have also been found in this deposit, of which 10 occurred in the Long Arcade, 6 in Clinnick's Gallery, 5 in Underhay's Gallery, and 5 in the Cave of Inscriptions.

The finest of the series (No. 4411) and indeed one of the finest the cavern has yielded from the commencement, was found April 23, 1874, in the fourth or lowest foot-level, with 1 tooth of bear, fragments of bone, and a small chert flake (No. 4411) which had probably been rolled. It measures 4·5 inches in length, 3 inches in greatest breadth, 1·1 inch in greatest thickness, is very convex on one face, slightly so on the other, retains a portion of the original surface near the butt end, and is rudely quadrilateral in form, with the angles rounded off. Several flakes have been struck off each face, and the edge to which it has been reduced along its entire margin, except at the butt end, is by no means sharp; its surface is almost completely covered with an almost black, probably manganese smut, whilst a slight chip near the pointed end shows it to consist of a very light-coloured granular chert. Several lines betokening planes, probably of structural weakness or perhaps of fracture, entirely surround it. If it has really been fractured, it must have occurred where the tool was found, and the parts have been naturally reunited without being faulted. Its character as well as its position shows that this fine implement belonged to the era of the Breccia.

This specimen is of considerable interest, both on account of the lines which cross its surface and of the position it occupied.

Amongst the flint implements found in Brixham Cavern that known as No. 6—8 has attracted considerable attention, and has been described and figured by Mr. John Evans, both in his "Ancient Stone Implements" and in the "Report on the Exploration of Brixham Cave." It was found in two pieces, the first on the 12th of August, 1858, the second, 40 feet from it, on the 9th of the following September; and it was not until some time after the latter date that the late Dr. Falconer discovered that the two fragments fitted each other, and when united formed a massive spear-shaped implement. The lines on the Kent's Cavern specimen just described show that it had either been fractured where it was found, or, what seems more probable, that it is traversed by planes of structural weakness, such that a slight blow would break it into two or more pieces, which a stream of water would easily remove and probably separate, and thus produce a repetition of the Brixham case.

The Kent's Cavern tool was found in a small recess in the wall, just within the outer or wider entrance of Clinnick's Gallery, within a very few feet of the Inscribed Boss of Stalagmite, and, as has already been stated, in the fourth foot-level of the Breccia; that is, at the greatest depth in the oldest of the cavern deposits to which the present exploration has been carried, and

is thus wonderfully calculated to take the mind step by step back into antiquity.

First, very near the spot occupied by the specimen, there rises a vast cone of stalagmite, which an inscription on its surface shows has undergone no appreciable augmentation of volume during the last two-and-a-half centuries.

Second, prior to that was the period spent in raising the greater portion of this cone, which measures upwards of 40 feet in basal girth, reaches a height of fully 13 feet, and contains more than 600 cubic feet of stalagmitic matter.

Third, still earlier was the era during which the cave earth was introduced, in a series of successive small instalments with protracted periods of intermittence, when the cavern was alternately the home of man and of the cave hyæna, and the latter dragged thither piecemeal so many portions of extinct mammals as to convert the cave into a crowded palæontological museum.

Fourth, further back still, was the period during which the base or nucleus of the cone or boss was laid down in the form of crystalline stalagmite.

Fifth, and earliest of all, was the time when materials not derivable from the immediate district were carried into the cavern, through openings now probably choked up, entirely unknown, and the direction in which they lie but roughly guessed at, when apparently the cavern-haunting hyæna had not yet arrived in Britain. At an early stage in this earliest era man occupied Devonshire; for prior to the introduction of the uppermost four feet of breccia, one of his massive unpolished tools, rudely chipped out of a nodule of chert, found its way into a recess in the cavern, and having a character such as to show that it must have lain undisturbed in the same spot until it was detected by a committee of the British Association.

SCIENTIFIC SERIALS

THE *Journal of the Chemical Society* for September contains the following papers communicated to the Society:—On the products of the decomposition of castor oil, No. 3. On the decomposition by excess of alkaline hydrate, by E. Neison. The action of sodium hydrate mixed with water gives rise to the formation of a mixture of an alcohol and a ketone on distillation. The alcohol is an octylic alcohol, which the author regards as the secondary

alcohol methyl-hexyl carbinol $\text{H} \begin{cases} \text{C}_6\text{H}_{13} \\ \text{CH}_3 \\ \text{H} \\ \text{OH} \end{cases}$ The ketone is methyl-

hexyl ketone. The olefine derived from the alcohol has been examined. The supposed heptylic alcohols of Städeler and Petersen turn out to be a mixture of octylic alcohol with methyl-hexyl ketone.—On the action of nitrosyl-chloride on organic bodies, Part I. On phenol, by Dr. W. A. Tilden. The phenol is oxidised to quinone, which substance is then converted into chloramil, the nitrosyl-chloride being completely reduced—a certain amount to ammonium chloride.—Aniline and its homologues, &c., in coal-tar oils, by Watson Smith.—On the action of chlorine, bromine, &c., upon isodinaphthyl, by Watson Smith and James M. Poynting. The action of chlorine gives rise to the formation of a tetrachlorinated derivative, $\text{C}_{20}\text{H}_{10}\text{Cl}_4$. Bromine replaces seven atoms of hydrogen, giving rise to the compound $\text{C}_{20}\text{H}_7\text{Br}_7$. With concentrated sulphuric acid a conjugate acid is formed, of which the barium and sodium salts have been examined. Both the chlorinated and brominated derivatives are amorphous powders.—On hydrogen persulphide, by William Ramsay. The persulphide was prepared by first saturating alcohol with ammonia gas, and then passing sulphuretted hydrogen through the solution. The ammonium sulphide thus produced was shaken up with sulphur and a solution of strychnine in alcohol added. White crystals having the formula $\text{C}_{21}\text{H}_{22}\text{N}_2\text{O}_2\text{H}_2\text{S}_3$ separate out on standing. These crystals treated with sulphuric acid yield hydrogen persulphide in the form of oily globules, but the yield is small, and the separation from the sulphuric acid extremely difficult. The author finally adopts the old method of pouring calcium persulphide into hydrochloric acid. Analyses of the compound thus obtained gave results indicating a formula between H_2S_7 and H_2S_{10} . The properties of the persulphide have been examined in some detail.—The journal contains its usual valuable collection of abstracts.

Geological Magazine, Oct. 1874.—The original articles contained in this number are (1) a continuation of Mr. Lechmere Gupp's article on West Indian Tertiary Fossils; (2) Notes on